M

Machine address synonymous with ABSOLUTE ADDRESS.

Machine cycle the minimum length of time in which a repetitive operation may be performed. In practice this minimum time is not regularly achieved since the operating conditions vary so much. It is actually the time to perform a predefined operation under laboratory conditions.

Machine language (code) a binary code, the only language that is understood by a computer. All other programming languages must be translated into binary code before processing. Output can be in binary form or can be decoded back into the original language. All computers have their own machine, or machine level, language.

Machine readable media that a computer is capable of interpreting as input. For example, tapes, cards and disks are the well-known machine readable media. OCR (Optical Character Readers) OMR (Optical Mark Readers) and a variety of other media are expanding the range of machine readable media.

Macro a group of program instructions used for a fixed, repetitive purpose. It has less function than a subroutine but is more powerful than a single instruction.

Magnetic disk circular platters coated with magnetic material to facilitate data recording. Data is written as tracks around logical 'cylinders' on the disk. There are a variety of technologies utilised in magnetic disk recording but the majority employ rotating disks with a read/write head for every surface, moving in and out on a fixed axis. Generally a small number of outer cylinders are used for addressing purposes.

Magnetic flux the measurement of the magnetic field strength through a given area, surrounding a magnet or conductor.

Magnetic tape flexible, standard width, acetate tape coated with magnetic powder. Numerous magnetic codes, all binary based, are used for data recording and error checking. In order to ensure interchangeability of tapes the bps, or bits per inch capacity of the tape drives have to be compatible.

Mainframe computer the generic term given to the earliest

computers produced by IBM and other large manufacturers. Initially punch card input machines they all require extensive and sophisticated operating systems to enable economic use, or shared use of the computer. The term has now lost its meaning since the advent of minicomputers.

Mains the plumbed-in power source, distributed nationally. Different countries have different standards. The US distributes 110 V at 60 Hz. The UK 240 V at 50 Hz.

Make to close, or complete, a circuit by means of contacts, switches, circuit breakers, etc.

Mask a photographic plate on which is printed the INTEGRATED CIRCUIT pattern required for a single step of the silicon wafer fabrication process. Mask also refers to a programming technique to enable individual bits to be addressed and manipulated. This technique involves a process of reading a WORD or a BYTE and then ignoring all bits except the particular bit under investigation.

Mass storage the generic term for large scale, bulk, magnetic storage. Drums or the newer disk systems can now store up to 1 billion bytes.

Mathematical operation the performance of a combination of arithmetic tasks by a computer, under program control.

Matrix figures or characters, organised as a tabular array. A DOT MATRIX array is used for printing and CRT display purposes.

Media the name for the basic consumable items on which data is recorded, e.g. card, paper tape, magnetic tape, etc.

Medium-scale Integration (MSI) a term generally applied to integrated circuits containing from 20 to 100 logic gates or less than 1000 memory bits. ◊ LSI, VLSI, SSI.

Mega (M) Meaning times 1,000,000 (10^6), as in megabit or megabyte. To be accurate the term means 1,048,576 or 2^{20} in binary terms.

Memory that part of the computer system into which information can be recorded and held for future use. Storage and memory (and core) are interchangeable expressions. Memory will only accept and hold binary numbers.

Memory address register (MAR) the register in the central processing unit which holds the address of memory being used.

Memory addressing modes the means by which memory is addressed, such as direct, indirect, indexed, relative and sequential.

Memory dump a listing of all or part of the contents of memory or any storage device. Under program control quite detailed selections of memory to be dumped may be achieved.

Memory mapping input/output hardware, addressed as if it were computer memory, is termed 'memory mapped'.

A different use of the same term refers to a map showing addresses and contents of memory, to aid efficient use of memory by programmers. ◊ ADDRESSING, COMMON DATA BASE.

Memory protect a technique which prevents contents of memory from being overwritten by other data or programs.

Merge the insertion of data in the correct sequence into a file of data which already exists. Merging can be performed as a separate operation after sorting the input data prior to updating a file, or can be done in a real time mode, one record at a time, in no particular sequence.

Metal Oxide Semiconductor (MOS/MOSFET) a specific semiconductor technology in which the gate electrode is a metal, silicon oxide an insulating barrier, and carrier doped regions in a silicon substrate become the drain and source electrodes. MOS is a Field Effect Transistor (FET) having a high input resistance. Types of MOS include: p-channel MOS (pMOS or PMOS); n-channel MOS (nMOS or NMOS). ◊ CMOS, VMOS.

Micro (μ) Meaning divided by 1,000,000 (1/1,000,000th or 10^{-6}).

Microcode internal computer code which is not usable by a programmer. Contained in ROM, microcode is very detailed logic which controls the decoding of individual program instructions. Synonymous with Microinstruction. ◊ MICRO-PROGRAM.

Microcomputer a microcomputer is a collection of devices that includes a microprocessor, memory and associated interface circuits to communicate with peripheral devices or other circuits.

Microcomputer analyser a device that is able to record and display on a VDU contents of memory, with location, in HEXADECIMAL CODE.

Microinstruction ◊ MICROCODE.

Microelectronic devices the generic term for electronic components or circuits made to very small dimensions. The density of packaging of certain microelectronics devices, such as memory and logic gates is defined by specific terms. ◊ DENSITY.

Micron (μ). note identical symbol to micro. A Micron is 1/1,000,000 metre or 10^{-6} metre. Can also be known as a micrometre.

Microprocessor the microprocessor is a central processing unit fabricated on a chip. It comprises, in general, an arithmetic and logic unit, control block and register array.

Microprocessor development systems ◊ DEVELOPMENT SYSTEMS.

Microprogram a program created from microcode. Used to write the instruction set of a particular programming language.

Microwave an electromagnetic wave which covers the frequencies between EHF (Extremely High Frequency) and VHF (Very High Frequency). Used for high speed data transmission.

Milestone ◊ SENTINEL.

Mill Babbage's term for the arithmetic unit in his design for an Analytical Engine, the first computer.

Milli (m) meaning divided by 1000 (1/1000th or 10^{-3}).

Minicomputer the distinctions between mini and mainframe have blurred with the acceleration in the development of new technologies. A mini is generally called a mini because its manufacturer calls it a mini. The differences between mini and micro are much more obvious because of size and, as yet, a limit on speed and performance of the micro; but with dramatically lower prices than a mini.

Mips Millions of instructions per second. A comparative processor speed measurement for the most powerful processors.

MKS system the accepted system for measurement and notation, based on the earlier metric version, cgs. MKS stands for Metre-Kilogram-Second.

Mnemonic Code a code designed to assist the programmer's memory. The binary code is assigned groups of letters that imply the definition of the instruction. It is a symbolic language used widely in programming languages, at high and low level.

Mode the state or style in which a machine or program has been set by programs or circuits for a specific task.

Modelling the simulation of events or systems using a computer and a variety of programming techniques. ◊ CYBERNETICS, STOCHASTIC, HEURISTIC.

Modem an acronym derived from MOdulation/DEModulation device. It enables computers or peripherals to communicate via telephone lines, or special dedicated data lines, by translating binary data signals to voice signals which can be carried over a telephone line, and then retranslating them to data signals at the other end of the line.

Module refers to a program component or system component that is discrete and can be separately identified and addressed.

Molecule a grouping of atoms for a particular material which is the smallest part of that material which can exist without loss of identity.

Monitor a commonly used term for the Cathode Ray Tube (CRT). Elements of some operating systems contain a monitor or executive suite of control programs.

Monolithic a system which is completely contained on one chip or substrate.

Move to 'copy the contents of'. Synonymous with load.

MSI ◊ MEDIUM-SCALE INTEGRATION.

MTBF Mean Time Between Failure. The average time, expressed in hundreds or thousands of hours, of the interval between device failures. This figure is used to calculate spares holding and service back up requirements.

MTTR Mean Time To Restore (Repair). The average time taken to bring a device, or system, back up to its normal operating performance level. Used by suppliers and the larger computer users, in conjunction with MTBF figures for maintenance planning and spares provisioning purposes.

Multilayer a sandwich or multiple layer printed circuit board. A device for fitting several boards, their components and connections into a confined space.

Multiplexing a process of transmitting more than one signal at a time over a single channel. A technique used to enable several

devices to share a communications channel with a computer system or electronic system.

Multiplicand one half of a simple multiplication, the other being the multiplier.

Multiplier the hardware module which performs multiplication. ◊ MULTIPLICAND.

Multiprocessing the act of processing a number of programs or subroutines, at the same time. Actually the processor schedules tasks and takes them in order to service several users in a time-sharing environment.

Multiprogramming where several programs are being operated simultaneously by a single processor. Different programs are handled in separate partitions (e.g. background and foreground), each partition having different priorities. ◊ BACKGROUND and FOREGROUND.

Multi user a real time computer system, often designated as time-sharing which is established to serve a group of separate and otherwise unconnected users.

Multi-word instruction program instructions which require more than one line or location in the portion of memory occupied by a specific program.

Mylar a tradename for the most commonly used acetate in magnetic tape production and for general insulation purposes.

N

Naked a computer or electronics system composed of printed circuit boards and mounted in a chassis. A 'naked' system does not possess the industrially designed outer casing or customised input/output connections to enable it to appear unique to a particular OEM. The term applies to mini and microcomputer suppliers as well as electronic product and system suppliers.

NAND gate similar to the AND gate but producing an inverted signal. See appendix for LOGIC CIRCUITS.

Nano (n) meaning divided by 1,000,000,000 (1/1,000,000,000th or 10^{-9}). Note in US and French notation this is termed to be one billionth.

NC Numerical Control. An electronic method of controlling the tool movements in machine tools and various associated products, such as graph plotters and electronic design aids. The coordinates at the end of any given tool travel are converted by the program into numerical values. Programs and systems exist to simulate the movements of tools and other moving parts of machine tools in the three basic dimensions, x, y and z, together with combinations which can combine to machine a perfect spheroid shape, if necessary.

Negative feedback degeneration, or the inverse of feedback. ◊ FEEDBACK.

Neon an inert gas which dispenses a red glow when ionised. Neon lamps are used in many forms of instrumentation as indicators or warning devices.

Nested (Loops and subroutines) software programs that use LOOPS within loops are said to be nested. Subroutines that use other subroutines are said to be nested. The nesting level is the number of times nesting can be repeated.

Network a term meaning an interconnecting series of processors, channels and peripheral devices. Also applied to project planning (PERT), a procedure to illustrate the interconnection and interdependence of tasks within an overall project. ◊ PERT.

Neutron an elementary particle having zero charge.

Nibble (nybble) one half of a byte or a 4 bit word.

NIH Not Invented Here. A rather caustic acronym describing the attitudes of vested interests to new products or designs; the implication being that since it was not invented here, it is worthless.

nMOS or NMOS n channel MOS. A type of field-effect transistor (FET) structure in which the conducting channel is n-type (negative) semiconductor material. n-channel devices operate at higher speed than p-type (positive) devices. The current actually passes through silicon crystals.

Node one term for the terminal of any branch of a network having more than one branch.

Noise interference; electrical, acoustic or mechanical.

Non-linear a relationship between input and output that exhibits indirect or random characteristics. A polynominal relationship is deemed to be non-linear.

Non-volatile memory a memory which retains its contents even after power has been discontinued. Does not generally apply to semiconductor memory, fusible links and magnetic memories are non-volatile types.

Normalise to take a statistical mean, ignoring mathematical signs, in order to obtain a usable, normal numerical value.

NOT a logic operator. A circuit whose output is high if input is low. An inverter. See appendix for LOGIC CIRCUITS.

npn transistor a junction (or BIPOLAR) transistor fabricated with p-type semi-conductor base between two pieces of n-type semiconductor, the collector and emitter.

Nuclear referring to the massive central portion of an atom, the nucleus.

Nucleus the large central part of an atom.

Null mathematically and geometrically in balance at zero value; in equilibrium.

Numerical Control ◊ NC.

O

Object program (Code) a source program produces an object program in binary code after it has been translated or assembled. Often referred to as object code, it is the only form in which a computer can read a program.

oc open circuit. A break in the current path or track of a PCB (printed circuit board), causing current leakage.

OCR Optical Character Recognition, or Optical Character Reader. A device which converts special typefaces into digital signals when scanned by the reading head. Can be an on-line device, or an off-line device producing paper tape or other media containing the data. Typefaces which make character identification easier for an optical scanner have been developed by several manufacturers.

Octal a number system constructed around the base 8.

Decimal	Binary	Octal
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	10
9	1001	11
10	1010	12
11	1011	13
12	1100	14
13	1101	15
14	1110	16
15	1111	17

See appendix for CODES

Odd-parity check (parity check) this is a popular programming technique to establish whether a number is odd or even. The

computer adds up all the binary digits in a field (word, character, etc). The result is then compared with an established parity bit for that particular data field, to check whether the number of bits present is odd or even. After comparison the results determines whether the program will allow the contents of that field to be accepted as valid data for further processing by the computer.

OEM Original Equipment Manufacturer. A loosely applied term. It was originally applied to the major computer manufacturers. It is now increasingly being used to describe a company buying equipment, often from several different sources, assembling them into a unique configuration or with a unique function and then selling it on to a user, agent or distributor. The term now implies that the company adopting the description of OEM adds value to equipment before reselling it.

Off-line equipment that can function without necessarily being connected to a computer. For example, a card punch or an optical character reader which produces paper type from scanned input.

Off-line storage data stored in a media not contained in a device connected to the CPU, such as disk cartridges containing data but not loaded onto the disk drive, paper tape, punch cards, etc.

Ohms (Ω) a measure of the RESISTANCE or individual resistances in a circuit when the current flow is direct (DC).

OMR ◊ OPTICAL MARK READER.

On-board (In board) the generic term applied to electronic systems which are installed in moving vehicles, operating independently of mains power.

On-line the term that describes those computer peripherals that need to be connected to a central computer to function. Popularly refers to interactive terminals.

On-line storage the media, e.g. tapes and disks, which store data when connected to the CPU. ◊ AUXILIARY STORAGE.

On-line system a computer system where all input, processing and output is performed simultaneously. For example, an enquiry may be input through a terminal and the resultant data immediately displayed on that terminal, or a print out generated.

Operand the quantity on which a mathematic operation is performed. When two operands are employed, as in addition and

subtraction for example, the first is called the source operand and the second is called the destination operand.

Operating Codes (Op code) SOURCE PROGRAM statements which generate machine codes after ASSEMBLY are referred to as operating codes, in particular that part of the source code which implies its function, i.e. describes what it does.

Operating system (OS) the main supervisor programs which are resident in memory and provided by the equipment supplier. Operating systems have certain basic functions in common between rival systems, e.g. disk handling, reading, writing and utilities such as disk to print dump, disk to disk write etc. However, the larger the computer the larger are the differences. It is claimed by many observers that the largest portion of computer companies development expenses these days is spent on software in general, and operating systems in particular.

Operation the task performed by a single computer instruction or simple subroutine.

Operational amplifier (op amp) a two stage (or more) amplifier constructed to perform arithmetic functions. Employed widely in analog computers.

Operators characters representing the basic mathematical functions such as +(plus), −(minus).

Optical Character Reader ◊ OCR.

Optical Isolation a filter which only allows a voltage within specified limits to complete a circuit. Used to protect circuits from external overloads due to SPIKES, DROPOUTS, etc.

Optical Mark Reader (OMR) equipment which utilises marks or identification by special pencils or readable signs in special fields on an input document. Used particularly for creating computer-readable documents for applications which cannot justify an extra key punching operation from clerically created input documents. A rather specialised input method which is tending to be left behind as the cost of hardware declines and labour costs increase.

OR gate a discrete component which requires either (but not both) of two input signals to generate an output signal. See appendix for LOGIC CIRCUITS.

OS ◊ OPERATING SYSTEM.

Oscillator a device to generate a periodic variation of electrical current or voltage. When applied to a microprocessor it is usually coupled with a crystal to provide very accurate time intervals for reading operations.

Oscilloscope (Scope) a widely used instrument. It can display an image of signal wave forms, either current or voltage, plotted against time.

Output the results of a computer program or run, in the form of any of the normally used computer media, e.g. printed output, output on disk, magnetic tape, punch card, paper tape or displayed output on a VDU.

Over specify to ask for, or define, an ideal system rather than a system capable of performing a specific task and no more. Over-specifying is a common occurence, especially by people or organisations specifying equipment for the first time.

Overlay the process of segmenting a program and calling segments into main memory as required. It is used to obtain efficient use of memory or to make memory process a program that is too large to fit into memory all at once. ◊ VIRTUAL MEMORY.

Overload the condition caused by loading an electrical component or device above its rated loading value. The amount of tolerance to overload is known as the overload capacity.

Oxidation the process of turning the surface of a silicon chip to silicon dioxide (silica). In this case the silicon dioxide is used as a barrier or insulator to the diffusion of the selected impurities used to create the various MOS devices. ◊ MOS (Metal Oxide Semiconductor).